

Recent advances

Management of patients in fast track surgery

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Surgery is slowly undergoing revolutionary changes due to newer approaches to pain control, the introduction of techniques that reduce the perioperative stress response, and the use of minimally invasive operations. Subsequently, many surgical procedures (such as arthroscopic surgery, laparoscopic cholecystectomy, eye surgery, sterilisation procedures, herniorrhaphy, and cosmetic operations) are routinely performed on an outpatient basis. Recently published pilot studies suggest that when these newer approaches are used in patients undergoing more complex elective surgical procedures, postoperative complications can be reduced, length of hospital stay decreased, and time to recovery shortened. This review of recent advances made in this newly developing specialty of fast track surgery will emphasise techniques that facilitate early recovery after major surgical procedures.

What is fast track surgery?

Fast track surgery combines various techniques used in the care of patients undergoing elective operations. The methods used include epidural or regional anaesthesia, minimally invasive techniques, optimal pain control, and aggressive postoperative rehabilitation, including early enteral (oral) nutrition and ambulation. The combination of these approaches reduces the stress response and organ dysfunction and therefore greatly shorten the time required for full recovery.

Recent advances in understanding perioperative pathophysiology have indicated that multiple factors contribute to postoperative morbidity, length of stay in hospital, and convalescence (fig 1). Major improvements in surgical outcome may therefore require multifaceted interventions (fig 2). Ambulatory surgery has become routine for many procedures with a well documented record for safety and low morbidity, even in patients at high risk.¹⁻² Studies of fast track surgery have evaluated somewhat similar approaches toward larger operations which carry more risk (box). Preliminary results from predominantly non-randomised trials have been positive (table). These studies have included high risk elderly patients undergoing operations such as segmental colonic resection, prostatectomy, and aortic aneurysmectomy. These preliminary data indicate topics for further randomised trials; the data need to be confirmed and extended to include end points of reduced costs, preserved safety, and patient satisfaction.

Recent advances

Newer techniques in surgery and anaesthesia that reduce the postoperative stress response are improving surgical outcome

Use of these methods in day surgical units will be extended to more complex surgical procedures, thus decreasing length of time in hospital

Regional anaesthesia and minimally invasive operative techniques are central to these changes

Shortened postoperative recovery should be the focus of rehabilitation care units, which optimise pain relief, mobilisation, and nutrition

Early patient discharge will be accompanied by functional recovery and presumably less morbidity

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We searched Medline from 1980 to the present and reviewed the articles identified. This information was supplemented with our own research on the mediators of the stress response in surgical patients, the use of epidural anaesthesia in elective operations, and pilot studies of fast track surgical procedures with the multifaceted approach.¹²

Preoperative evaluation and education

Before any operation, including fast track surgery, organ function should be optimised for patients with cardiac disease, chronic obstructive lung disease,

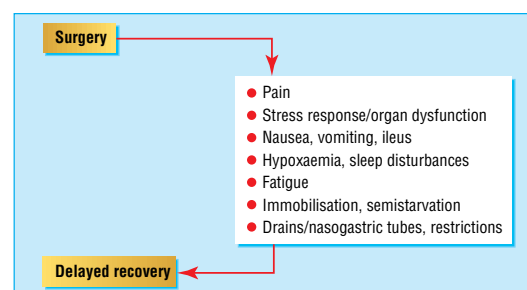


Fig 1 Factors contributing to postoperative morbidity

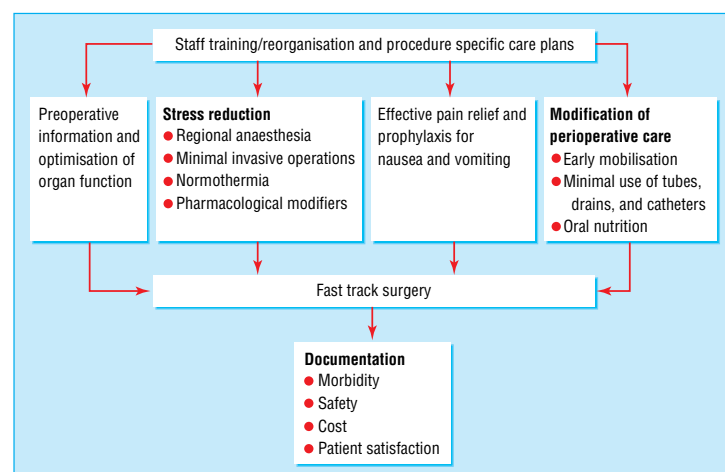


Fig 2 Interventions needed for major improvement in surgical outcome

diabetes mellitus, and other disorders, according to current recommendations. Pharmacological means have been used to enforce abstinence in alcohol misusers, and this has resulted in lower morbidity and enhanced recovery in such patients.¹³ Prolonged (one to two months) cessation of smoking in the preoperative period should also be encouraged to reduce postoperative respiratory complications.

Education of patients about perioperative care before the operation reduces the need for pain relief,¹⁴ can include instruction on relaxation techniques which can be used after the operation, reduces anxiety, and

improves outcome.¹⁵ Patients can access information on specific clinical procedures on www.facs.org/public_info/operation/aboutbroch.html, which is provided by the American College of Surgeons.

Optimising anaesthesia

Recent developments in techniques in anaesthesia have optimised conditions for surgeons to operate while allowing for very early recovery of vital organ function after major procedures. Thus, the introduction of rapid short acting volatile anaesthetics (for example, desflurane and sevoflurane), opioids (for example, remifentanyl), and muscle relaxants have facilitated expansion of ambulatory surgery for minor to moderate procedures (see box). However, the same techniques may be used to facilitate early recovery and decreased need for prolonged monitoring and stay in recovery and high dependency wards after major procedures, although this issue has been less explored and documented than the use of such techniques for minor procedures.¹⁶ The use of anaesthetic techniques that provide for minimal carryover of opioid effects into the recovery period, supported by other non-opioid analgesic methods (see below), may minimise postoperative complications and facilitate recovery after major procedures.

Most, if not all, postoperative organ dysfunction and morbidity associated with major operative procedures may be related to changes induced by stress caused by the operation. Neural blockade techniques have been developed in recent years to provide attenuation of the surgical stress response, thereby reducing postoperative organ dysfunction and allowing early recovery.¹⁷

After experimental studies showed that the peripheral and central nervous system was crucial in the initiation of the endocrine-metabolic response to injury, a vast amount of research has shown that regional anaesthetic techniques that use local anaesthetics can reduce the classic pituitary, adrenocortical, and sympathetic responses to surgery.¹⁷ Neurogenic blockade (either by administering a local anaesthetic in the spinal or epidural space or by using local anaesthetic techniques that block the nerve impulses from an area) improves postoperative nitrogen economy and glucose intolerance but does not modify inflammatory or immunological responses. Relevant to clinical care, continuous neural blockade for 24 to 48 hours is necessary for a pronounced reduction in perioperative stress in major surgery.¹⁷ Moreover, the systemic effects of local or regional anaesthesia/analgesia on the stress response are greatest in procedures on the lower body (lower extremities or pelvis) compared with upper abdominal and thoracic operations. The effects of regional anaesthetic techniques are manifest by improved pulmonary function, decreased cardiovascular demands, reduced ileus, and improved pain relief.¹⁷ A recent meta-analysis of regional anaesthetic studies showed a 30% reduction in morbidity compared with general anaesthesia.¹⁸

Recent developments on fast track surgery from single centre studies

Operation	Hospital stay
Laparoscopic cholecystectomy	Ambulatory procedure ³
Laparoscopic or vaginal hysterectomy	Ambulatory procedure, 1 day ⁴
Laparoscopic gastro-oesophageal reflux surgery	Ambulatory procedure, 1 day ⁵
Elective surgery for aortic aneurysm	3-4 days ⁶
Carotid endarterectomy	1-2 days ⁷
Mastectomy	Ambulatory procedure, 1 day ⁸
Lung lobectomy	1-2 days ⁹
Prostatectomy	1-2 days ¹⁰
Partial colectomy	2 days ¹¹

Examples of fast track surgery

Ambulatory or 24 hour surgery

Extensive knee and shoulder reconstruction (laparoscopy/endoscopy)
Vaginal hysterectomy
Gastric fundoplication (laparoscopy/endoscopy)
Splenectomy (laparoscopy/endoscopy)
Adrenalectomy (laparoscopy/endoscopy)
Donor nephrectomy (laparoscopy/endoscopy)
Mastectomy
Cholecystectomy (laparoscopy/endoscopy)

Short stay surgery—1 to 4 days

Colectomy
Total hip and knee replacement
Aortic aneurysmectomy
Pneumonectomy and lobectomy
Radical prostatectomy
Peripheral vascular reconstruction

Operative techniques

Minimal invasive surgery

The use of minimal invasive abdominal surgical techniques, such as laparoscopic cholecystectomy, have not reduced the early endocrine mediated metabolic response to surgery, but this approach has been associated with a decrease in various inflammatory responses and immunodysfunctions.¹⁹ Pulmonary function seems to be improved and postoperative ileus reduced with minimal invasive approaches.¹⁹⁻²⁰ Other studies have reported less pain, shorter hospital stays, and reduced morbidity, not only in abdominal surgery but also in cardiothoracic, vascular, cerebral, and major orthopaedic procedures. The scientific basis for these effects remains incompletely understood, and more basic studies are necessary to improve our understanding of the influence of minimal invasive surgery on postoperative responses.

Intraoperative normothermia

Operating rooms are cold. Patients are inadequately clothed and receive anaesthetics which hamper their homeostatic defences to cold. As a result, patients undergoing operations lasting over two hours often become hypothermic, with a fall of core temperature of 2-4°C. During rewarming cortisol and catecholamines are released, which augment the stress response of the operation.²¹ Keeping patients warm has been associated with a threefold decrease in the rate of wound infection, a reduction in operative blood loss, a decrease in untoward cardiac events, including ventricular tachycardia, and a reduction in nitrogen excretion and patient discomfort.²¹ Maintenance of a normal temperature during surgery is central to reducing the stress of the surgical procedure and reducing the risk of organ dysfunction.

Postoperative care

The first 24 hours

Nasogastric tubes should not be used routinely in patients undergoing elective gastrointestinal surgery. A large meta-analysis of 26 randomised trials concluded that routine use may, in fact, be detrimental by increasing the incidence of pneumonia and delaying early enteral feeding by nasogastric tube.²² Likewise, randomised trials of drains show little benefit after cholecystectomy, joint replacements, colon resection, thyroidectomy, and radical hysterectomy.²³⁻²⁴ Drains limit formation of seroma after mastectomy, but such wound drainage does not limit discharge from hospital.

Bed rest is undesirable as it increases muscle loss and weakness, impairs pulmonary function, and predisposes to venous stasis and thromboembolism.²⁴ All efforts should be made to enforce postoperative movement, which is possible with adequate pain relief.

Oral intake is commonly limited in the postoperative period. Presently there are no available clinically effective drugs that enhance gastric emptying,²⁵ and with the attenuation of ileus associated with epidural anaesthesia, oral intake can often be successfully initiated six hours after surgery, even after colonic operations which use an anastomosis.¹¹ Pharmacologi-

cal treatment should be used if nausea and vomiting are present.

Postoperative pain should be vigorously treated as it may amplify the surgical stress responses and organ dysfunction and prolong recovery.²⁶ Principles for optimising treatment of postoperative pain have been developed, providing pain relief which allows early movement. Improvement of pain management includes education of staff and patients, establishment of an acute pain service, and the use of multifaceted analgesic intervention.²⁷ After operations of minor to moderate size patients should receive non-opioid analgesics, such as non-steroidal anti-inflammatory agents, to avoid side effects related to use of opioid drugs, which prolong recovery.²⁶ Major surgical procedures with high intensity pain and subsequent organ dysfunction induced by stress require the use of invasive analgesic methods, such as continuous epidural analgesia, to hasten recovery.²⁴ Optimal management of acute pain after major procedures is a prerequisite for fast track surgery and should be used for all surgical patients.

Nausea, vomiting, and ileus

The ability to resume a normal diet is essential for a successful fast track surgical programme after both minor and major procedures. Principles for rational prophylaxis and treatment of nausea and vomiting have been developed,²⁸⁻²⁹ and several agents including droperidol, antiserotonergic drugs, and analgesic regimens with reduced use of opioid drugs will reduce these symptoms. The use of multifaceted regimens for nausea and vomiting in combination with dexamethasone requires further evaluation. Postoperative ileus, which is predominantly caused by a combination of inhibitory neural sympathetic visceral reflexes and the intestinal inflammatory response, may be considerably alleviated by a combination of epidural local anaesthetics, analgesia with reduced use of opioid drugs, minimally invasive surgery, and pharmacotherapy.¹⁷⁻²³ Preliminary studies show that such regimens, when combined with early enteral nutrition, may almost completely prevent paralytic ileus after colonic resection.¹¹⁻²⁵

The second to fifth postoperative day

Recovery from an operation depends on several factors, including the resolution of pain and fatigue. Fatigue in the early postoperative period is related to altered sleep within the hospital setting because of noise, environmental disturbances, drugs, and possibly inflammatory factors.³⁰⁻³¹ Loss of muscle strength and loss of weight because of reduced food intake have been related to fatigue, which occurs after a week or so.²⁴ Reduction of surgical stress, early enteral nutrition, and mobilisation are therefore important interventions which counteract fatigue and aid recovery.

The future

The initial promising results reported from fast track programmes raise the question of whether our traditional system of surgical care needs to be modified to improve surgical outcome. Shortened postoperative recovery may not necessarily require dependency on

traditional surgical units, which rely on monitoring and high tech intervention, but rather we may need to emphasise postoperative "rehabilitation care units" which optimise pain relief, mobilisation, and nutrition.

Further developments in the specialty of fast track surgery will require more effective methods for reduction of perioperative stress, such as β blockade³² and improved combinations of analgesia and anaesthesia. In addition, more sophisticated approaches toward minimally invasive surgery and possibly pharmacological modification of the inflammatory response may be necessary. Integration of these approaches with aggressive rehabilitative techniques is also required.

In the future, the trend will be for shorter recovery periods after major operations. Importantly, the increased use of fast track surgery with shorter hospital stays will not necessarily lead to an increased burden on general practitioners as the patients will be discharged without the postoperative impairment of function usually observed and hopefully with less morbidity. Thus, with continued understanding of perioperative pathophysiology and improvements in perioperative care, it may not be unrealistic in the next few years for the insertion of a hip prosthesis, the excision of a large cancer, or the repair of an aortic aneurysm to be performed as day surgery.

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Changing stockings

Remember who commended thy yellow stockings, and wished to see thee ever cross-gartered: I say, remember. Go to, thou art made, if thou desirest to be so; if not, let me see thee a steward still, the fellow of servants, and not worthy to touch Fortune's fingers. Farewell.

William Shakespeare, Twelfth Night

I was not sure whether I had got it right. "Yes, the patient seems to change stockings," the nurse repeated. I was on call and as a junior doctor I was becoming used to unusual requests. Being a foreigner made it worse, because often I did not even understand what they were talking about. I did not have any idea what the nurse wanted me to do with that information. All I could picture was Malvolio's yellow cross-gartered stockings, but I still could not make any sense out of it.

So I asked and the answer was frightening. "It means the patient is going to die soon," she stated in a tone that indicated how she disapproved of my lack of common knowledge. And her prognosis was correct: I found the patient terribly ill. But what a strange way to characterise his final state, assuming that he was

getting prepared (and dressed) for his own funeral. In Germany we call it "biting the grass," "crossing the River Jordan," or "passing one's spoon," but that would not be considered adequate in such a situation. Was this the legendary black humour of which my father had warned me?

"What is it like to start practising medicine in a foreign language?" one of our students asked me later. I thought that this incident was a good example of the unexpected difficulties you might encounter. Surprisingly he had never heard of the expression "changing stockings." But on the other hand he was English and so also a foreigner in Scotland. To my list of pitfalls for beginners, I actually added the advice: "If a nurse tells you a patient is changing stockings, get there right away." It took months until I finally discovered that people across the channel are not as cynical and strange as I had reported home: all the nurse had wanted to tell me was that our late patient was "Cheyne-Stoke-ing".

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